



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
[www.uspto.gov](http://www.uspto.gov)

1/22

| APPLICATION NO.   | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.       | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------------|------------------|
| 10/767,247  | 01/28/2004  | Naoki Watanabe       | 16869B-077300US           | 4787             |
| 20350   | 7590        | 01/13/2006           |                           |                  |
| TOWNSEND AND TOWNSEND AND CREW, LLP<br>TWO EMBARCADERO CENTER<br>EIGHTH FLOOR<br>SAN FRANCISCO, CA 94111-3834 |             |                      | EXAMINER<br>CAMPOS, YAIMA |                  |
|   |             |                      | ART UNIT<br>2185          | PAPER NUMBER     |

DATE MAILED: 01/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                        |                     |
|------------------------------|------------------------|---------------------|
| <b>Office Action Summary</b> | <b>Application No.</b> | <b>Applicant(s)</b> |
|                              | 10/767,247             | WATANABE, NAOKI     |
|                              | <b>Examiner</b>        | <b>Art Unit</b>     |
|                              | Yaima Campos           | 2185                |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 28 January 2004.  
 2a) This action is FINAL.                    2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-14 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1-14 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>9/29/05</u> . | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
|  | 6) <input type="checkbox"/> Other: _____                                    |

**DETAILED ACTION**

1. The instant application having Application No. **10/767,247** has a total of 14 claims pending in the application; there are 2 independent claims and 12 dependent claims, all of which are ready for examination by the examiner.

**I. INFORMATION CONCERNING OATH/DECLARATION**

*Oath/Declaration*

2. The applicant's oath/declaration has been reviewed by the examiner and is found to conform to the requirements prescribed in **37 C.F.R. 1.63**.

**II. INFORMATION CONCERNING DRAWINGS**

*Drawings*

3. The applicant's drawings submitted are acceptable for examination purposes.

**III. ACKNOWLEDGEMENT OF REFERENCES CITED BY APPLICANT**

4. As required by **M.P.E.P. 609(C)**, the applicant's submission of the Information Disclosure Statement dated September 29, 2005 is acknowledged by the examiner and the cited references have been considered in the examination of the claims now pending. As required by **M.P.E.P. 609 C(2)**, a copy of the PTOL-1449 initialed and dated by the examiner is attached to the instant office action.

**IV. REJECTIONS BASED ON PRIOR ART****Claim Rejections - 35 USC § 102**

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. **Claims 1-14** are rejected under 35 U.S.C. 102(e) as being anticipated by Bridge (US 6,530,035).

7. As per **claim 1**, Bridge discloses “A method of controlling a storage system having primary storage volumes and replication storage volumes which replication storage volumes improve reliability of the storage system,” as [**“the invention relates to a method and system for managing storage systems containing multiple storage devices” (Column 1, lines 9-11)** and also that **“to protect against the loss of information, data on the system can be mirrored (i.e., duplicated and stored) on two or more separate storage locations” (Column 1, lines 50-52)**. Bridge also explains that **“if a disk drive fails, protected extents can be rebuilt from that disk drive’s mirror partners” (Column 14, lines 53-54)** and that **“this reduces the meantime to repair the failure with a hot standby, since a higher I/O rate can be used to reconstruct lost data” (Column 14, lines 56-58)** wherein **“a lower mean time to repair reduces the probability of having two simultaneous failures” (Column 14, lines 61-62); therefore, providing higher reliability in a storage system]**

“the method comprising: determining a boundary of a potential failure of the primary storage volumes and the replication storage volumes;” [With respect to this limitation, Bridge discloses an equivalent method wherein “each disk drive is associated with a failure group. Two disk drives are in different failure groups if they do not share a common failure condition that is projected to affect both disk drives at the same time” (Column 2, lines 42-46) as failure groups encompass different failure boundaries]

“and using the determined boundary to assign replication storage volumes to assure that at least some of the replication storage volumes are outside the failure boundary” [Bridge discloses this limitation as “for mirroring, each disk drive is paired with one or more disk drives from other failure groups” (Column 2, 51-52) so that “two independent failures would be required to destroy both pieces of the data” (Column 4, lines 32-33); therefore, a mirror copy of a drive belongs in a different failure boundary as its mirror pair].

8. As per claim 2, Bridge discloses “A method as in claim 1,” [See rejection to claim 1 above] “wherein the potential failure boundary is determined by software managing the storage system” [With respect to this limitation, Bridge discloses that “all named drives in a failure group share some common disk drive failure criteria, which is any failure mode or condition which is projected to cause the related disk drives to fail at the same time period” (Column 13, lines 35-38) and explains that “hard-wired circuitry may be used in place of or in combination with software instructions to implement the invention” (Column 26, lines 36-40)].

9. As per claim 3, Bridge discloses “A method as in claim 2” [See rejection to **claim 2 above**] “wherein a logical address of locations in the storage system is used to determine the failure boundary” [With respect to this limitation, Bridge discloses that “the logical volume manager configures a pool of disk drives into logical volumes (also called logical disks) so that applications and users interface with logical volumes instead of directly accessing physical disk drives” (Column 1, lines 24-27)].

10. As per claim 4, Bridge discloses “A method as in claim 1” [See rejection to **claim 1 above**] “wherein there are a plurality of failure boundaries and each is determined by software managing the storage system” [With respect to this limitation, Bridge discloses that “all named drives in a failure group share some common disk drive failure criteria, which is any failure mode or condition which is projected to cause the related disk drives to fail at the same time period” (Column 13, lines 35-38) wherein “there should be at least two failure-groups to implement proper redundancy” (Column 14, lines 55-57) and explains that “hard-wired circuitry may be used in place of or in combination with software instructions to implement the invention” (Column 26, lines 36-40)].

11. As per claims 5-6 and 11-12, Bridge discloses “A method as in claims 4 and 10” [See rejection to **claim 4 above and rejection to claim 10 bellow**] “wherein information regarding the failure boundaries is stored as a table in the server” and “the server is used to manage the storage system” [With respect to this limitation, Bridge discloses that “a separate list is maintained for each disk drive with entries that describe each allocation unit on that disk drive. The example of FIG. 4 illustrates one embodiment of this list which is referred to as an *allocation table*” (Figure 4 and

**Column 10, lines 13-17) wherein “if a disk drive fails, the surviving allocation tables can be used to reconstruct any pointer extent on the failed device containing entries for allocation units on surviving devices” (Column 10, lines 41-44) and also explains that when a disk drive fails, “reconstruction can be accomplished by looking at the mirror partner’s allocation tables. Thus no other disk drives need to be examined” (Column 14, lines 58-61) as storing failure boundary information for both, primary and secondary (or mirror) volumes of data on each disk; therefore, each disk functions as a server for other disks in the system as each disk stores data pertaining to other disks. Bridge further discloses that “a server might transmit a requested code for an application program through Internet, ISP, local network and communication interface. In accordance with the invention, one such downloaded application manages storage systems that contain multiple data storage devices” (Figure 19 and Column 27, lines 43-49)].**

12. As per **claims 7 and 13**, Bridge discloses “A method/system as in claims 5 and 11” [See rejection to claim 5 above and rejection to claim 11 bellow] “wherein information regarding the failure boundaries also includes information about reliability of the primary storage volumes and the replication storage volumes” [Bridge discloses this limitation as “two disk drives on a common controller could be considered part of the same failure group for a high-reliability mirrored data system, but may be considered in two separate failure groups for a system having lower demand-levels for reliability” (Column 15, lines 2-6) as taking reliability information for each failure group into account].

13. As per claim 8, Bridge discloses “A method as in claim 1” [See rejection to **claim 1 above**] “wherein the boundary of the potential failure is used to assign storage volumes as replication storage volumes for a particular operation of the storage system” [Bridge discloses this limitation as “for mirroring, each disk drive is paired with one or more disk drives from other failure groups” (Column 2, 51-52) so that “two independent failures would be required to destroy both pieces of the data” (Column 4, lines 32-33); therefore, a mirror copy of a drive belongs in a different failure boundary as its mirror pair and failure boundary information is used to assign a mirror pair for a data volume].

14. As per claim 9, Bridge discloses “A method as in claim 8” [See rejection to **claim 8 above**] “wherein the failure boundary information includes error correction group and controller group information for each of the primary storage volumes and the replication storage volumes” [With respect to this limitation, Bridge discloses “using mirror partners also limit the chances of multiple-drive failures damaging a parity protected extent. A parity set is allocated by picking any disk drive as the primary disk to hold the parity extent and then allocating the data extents on its mirror partners. Each data extent should be located on a mirror partner that is in a different failure group from other extents in the parity set” (Column 14, lines 34-40) as including error correction information and further explains that “two disk drives on a common controller could be considered part of the same failure group for a high reliability mirrored data system” (Figure 6 and Column 15, lines 2-4) as including control group information].

15. As per **claim 10**, Bridge discloses “A storage system comprising: a set of primary storage volumes; a set of replication storage volumes for improving reliability of the storage system;” as [**the invention relates to a method and system for managing storage systems containing multiple storage devices**” (Column 1, lines 9-11) and also that “**to protect against the loss of information, data on the system can be mirrored (i.e., duplicated and stored) on two or more separate storage locations**” (Column 1, lines 50-52). Bridge also explains that “**if a disk drive fails, protected extents can be rebuilt from that disk drive’s mirror partners**” (Column 14, lines 53-54) and that “**this reduces the meantime to repair the failure with a hot standby, since a higher I/O rate can be used to reconstruct lost data**” (Column 14, lines 56-58) wherein “**a lower mean time to repair reduces the probability of having two simultaneous failures**” (Column 14, lines 61-62); therefore, **providing higher reliability in a storage system]**

“**a memory for storing information regarding at least one boundary of a potential failure of the primary storage volumes and the replication storage volumes;**” [With respect tot this limitations, Bridge discloses having “**allocation tables**” wherein “**if a disk drive fails, the surviving allocation tables can be used to reconstruct any pointer extent on the failed device containing entries for allocation units on surviving devices**” (Column 10, lines 41-44) and also explains that when a disk drive fails, “**reconstruction can be accomplished by looking at the mirror partner’s allocation tables. Thus no other disk drives need to be examined**” (Column 14, lines 58-61) as storing failure boundary information for both, primary and secondary (or mirror) volumes of data]

“and a controller coupled to the memory for assigning replication storage volumes to measure that at least some of the replication storage volumes are outside the failure boundary” [With respect to this limitation, Bridge discloses that “conventional data storage systems include one or more storage devices connected to a controller or manager” (Column 1, lines 13-14) and further explains that “two disk drives on a common controller could be considered part of the same failure group for a high reliability mirrored data system” (Figure 6 and Column 15, lines 2-4)].

16. As per claim 14, Bridge discloses “A storage system as in claim 11” [See rejection to claim 11 above] “wherein information regarding the failure boundaries also includes information about performance of the primary and replication storage volumes” [With respect to this limitation, Bridge discloses that “the size of allocation units is selected for desired performance characteristics. One factor to consider in this selection is the I/O performance of the disk drive(s) containing the allocation units” (Column 7, lines 16-19) and also explains that “pointer extents can be in a different disk group from data extents. This is useful for cases where one disk group has different performance characteristics than another” (Column 9, lines 48-50) as taking performance information for each failure group into account].

## V. RELEVANT ART CITED BY THE EXAMINER

17. The following prior art made of record and not relied upon is cited to establish the level of skill in the applicant’s art and those arts considered reasonably pertinent to applicant’s disclosure. See MPEP 707.05(c).

18. The following references teach storage systems having primary and secondary (or mirror) volumes wherein failure prediction is taken into account for data recovery or data backup.

**U.S. PATENT NUMBER**

US 6,965,976

US 5,611,069

US 6,412,089

US 2005/0071436

US 2003/0221058

US 6,766,465

US 6,154,853

**VI. CLOSING COMMENTS**

**Conclusion**

**a. STATUS OF CLAIMS IN THE APPLICATION**

19. The following is a summary of the treatment and status of all claims in the application as recommended by M.P.E.P. 707.07(i):

**a(1) CLAIMS REJECTED IN THE APPLICATION**

20. Per the instant office action, claims 1-14 have received a first action on the merits and are subject of a first action non-final.

**b. DIRECTION OF FUTURE CORRESPONDENCES**

21. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yaima Campos whose telephone number is (571) 272-1232 and email address is Yaima.Campos@uspto.gov. The examiner can normally be reached on Monday to Friday 8:30 AM to 5:00 PM.

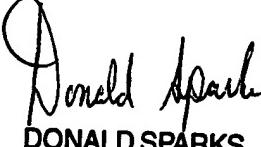
**IMPORTANT NOTE**

22. If attempts to reach the above noted Examiner by telephone or email are unsuccessful, the Examiner's supervisor, Mr. Donald Sparks, can be reached at the following telephone number: Area Code (571) 272-4201.

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

January 6, 2006

Yaima Campos  
Examiner  
Art Unit 2185

  
DONALD SPARKS  
SUPERVISORY PATENT EXAMINER